

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Canceled)

2. (Previously Presented) A thermal sensor circuit for sensing the temperature of an integrated circuit chip, the thermal sensor circuit including:

an output comparator for comparing a reference voltage, V_{ref} , with a sensed voltage, V_{sense} , the sensed voltage being measured from a sensing device;

a first circuit to which a reference voltage line is connected to supply V_{ref} to the output comparator;

a first current mirror providing a first current input to the first circuit and to a compensation circuit;

a second current mirror providing a second current input to the compensation circuit and to the sensing device, and wherein

the compensation circuit provides a current gain, defined as the ratio of the second current input to the first current input, for compensating for variations in V_{ref} due to variations of the characteristics of the thermal sensing circuit arising from manufacture by adjusting the second current input in dependence on the variations of the characteristics to thereby vary V_{sense} with V_{ref} , wherein the compensation circuit includes first, second, third and fourth bipolar junction transistors (BJTs) and wherein:

the first BJT has a collector terminal connected to the first current input of the first current mirror, a base terminal connected to a common base connection and an emitter terminal connected to ground;

the second BJT has a collector terminal connected to the second current input of the second current mirror, a base terminal connected to the common base connection and an emitter terminal connected to ground;

the third BJT has a collector terminal connected to the second current input, a base terminal connected the first current input and an emitter connected to the common base connection;

the fourth BJT has a collector terminal connected to a voltage supply of the thermal sensor circuit, a base terminal connected to the common base connection and an emitter terminal connected to ground; and

the ratio of emitter area of the fourth BJT to the emitter areas of the first, second and third BJTs is $N : 1$, where $N > 0$.

3. (Original) The thermal sensor circuit of claim 2, wherein the first circuit includes fifth and sixth BJTs, and wherein:

the fifth BJT has a collector terminal connected to the first current input, a base terminal connected to the reference voltage line and an emitter terminal connected to an output point of the first circuit via a first resistor;

the sixth BJT has a collector terminal connected to the first current input, a base terminal connected to the reference voltage line and an emitter connected to the output point of the first circuit; and

the output point of the first circuit is connected to ground via a second resistor.

4. (Original) The thermal sensor circuit of claim 3, wherein the ratio of emitter area of the fifth BJT to the emitter area of the sixth BJT is $M : 1$, where $M > 1$.

5. (Previously Presented) The thermal sensor circuit of claim 3 wherein each of the first to sixth BJTs is an n-p-n transistor.

6. (Previously Presented) The thermal sensor circuit of claim 3 wherein the current gain is given by:

$$\frac{I2}{I1} = \frac{\beta^2 + (3 + N)\beta}{\beta^2 + \beta + (2 + N)}$$

where:

I_1 is the first current input;

I_2 is the second current input; and

β is the common-emitter current gain of each of the first to sixth BJTs.

7. (Original) The thermal sensor circuit of claim 2, wherein the first and second current mirrors are connected to the voltage supply of the thermal sensor circuit and use p-n-p BJTs to supply the first and second current inputs, respectively.

8. (Previously Presented) A thermal sensor circuit for sensing the temperature of an integrated circuit chip, the thermal sensor circuit comprising:

a current source that supplies an input current;

a sensing device that produces a sensed voltage corresponding to the temperature of the integrated circuit chip;

a reference voltage circuit that produces a reference voltage;

a comparator that receives the reference and sensing voltages and outputs a signal that reflects the temperature;

a first current mirror having first and second mirror legs respectively carrying first and second mirror currents that are directly proportional to each other, the first mirror leg being in series with the sensing device; and

a compensation circuit that includes:

an input that receives the input current;

a first transistor coupled between the input and a first supply voltage reference and having a control terminal;

a second transistor coupled between the second mirror leg and the first supply reference and having a control terminal coupled to the control terminal of the first transistor; and

a third transistor coupled between a second supply voltage reference and the first supply voltage reference and having a control terminal coupled to the control terminals of the first and second transistors.

9. (Previously Presented) The thermal sensor circuit of claim 8 wherein the compensation circuit further includes a fourth transistor coupled between the second mirror leg and the control terminals of the first, second, and third transistors, and having a control terminal coupled to the input of the compensation circuit.

10. (Previously Presented) The thermal sensor circuit of claim 9 wherein the first, second, third, and fourth transistors are bipolar transistors.

11. (Previously Presented) A thermal sensor circuit for sensing the temperature of an integrated circuit chip, the thermal sensor circuit comprising:

a sensing device that produces a sensed voltage corresponding to the temperature of the integrated circuit chip;

a first current mirror having first and second mirror legs respectively carrying first and second mirror currents that are directly proportional to each other, the first mirror leg being in series with the sensing device; and

a compensation circuit that includes:

an input that receives the input current;

a first transistor coupled between the input and a first supply voltage reference and having a control terminal;

a second transistor coupled between the second mirror leg and the first supply reference and having a control terminal coupled to the control terminal of the first transistor; and

a third transistor coupled between a second supply voltage reference and the first supply voltage reference and having a control terminal coupled to the control terminals of the first and second transistors;

an output comparator having first and second inputs and an output, the first input being coupled to the sensing device to receive the sensed voltage;

a reference voltage circuit having an input and an output at which a reference voltage is produced, the output of the reference voltage circuit being coupled to the second input of the output comparator; and

a second current mirror having a first mirror leg coupled to the reference voltage circuit, and a second mirror leg coupled to the input of the compensation circuit to provide the input current.

12. (Previously Presented) The thermal sensor circuit of claim 11 wherein the second current mirror has a third mirror leg and the reference voltage circuit includes:

a fourth transistor coupled between the third leg of the second current mirror and the first supply voltage reference and having a control terminal corresponding to the output of the voltage reference circuit; and

a fifth transistor coupled between the first leg of the second current mirror and the first supply voltage reference and having a control terminal corresponding to the output of the voltage reference circuit.

13. (Previously Presented) The thermal sensor circuit of claim 12, wherein a ratio of an emitter area of the fifth transistor to an emitter area of the sixth transistor is M:1, where M>1.

14. (Previously Presented) The thermal sensor circuit of claim 11 wherein the first and second current mirrors are connected to the second supply voltage reference and include p-n-p bipolar transistors in their respective first and second mirror legs.

15. (Canceled)

16. (Currently Amended) A thermal sensor circuit for sensing the temperature of an integrated circuit chip, the thermal sensor circuit comprising:

a sensing device that produces a sensed voltage corresponding to the temperature of the integrated circuit chip;

an output comparator having first and second inputs and an output, the first input being coupled to the sensing device to receive the sensed voltage;

a reference voltage circuit having a first input and an output at which a reference voltage is produced, the output of the reference voltage circuit being coupled to the second input of the output comparator;

a first current mirror having first and second outputs, the first output being coupled to the first input of the reference voltage circuit;

a second current mirror having ~~first an input and second outputs an output~~, the first output being coupled to the sensing device; and

a compensation circuit having ~~first an input and second inputs an output~~ coupled respectively to the second ~~outputs output~~ of the first and second current mirrors ~~mirror and the input of the second current mirror~~, wherein the compensation circuit includes:

a first transistor coupled between the ~~first~~ input of the compensation circuit and a first supply voltage reference and having a control terminal;

a second transistor coupled between the ~~second input output~~ of the compensation circuit and the first supply voltage reference and having a control terminal coupled to the control terminal of the first transistor; and

a third transistor coupled between a second supply voltage reference and the first supply voltage reference and having a control terminal coupled to the control terminals of the first and second transistors.

17. (Currently Amended) The thermal sensor circuit of claim 16 wherein the compensation circuit further includes a fourth transistor coupled between the ~~second input output~~

of the compensation circuit and the control terminals of the first, second, and third transistors, and having a control terminal coupled to the ~~first~~-input of the compensation circuit.

18. (Previously Presented) The thermal sensor circuit of claim 17 wherein the first, second, third, and fourth transistors are bipolar transistors.

19. (Currently Amended) A thermal sensor circuit for sensing the temperature of an integrated circuit chip, the thermal sensor circuit comprising:

a sensing device that produces a sensed voltage corresponding to the temperature of the integrated circuit chip;

an output comparator having first and second inputs and an output, the first input being coupled to the sensing device to receive the sensed voltage;

a reference voltage circuit having a first input and an output at which a reference voltage is produced, the output of the reference voltage circuit being coupled to the second input of the output comparator;

a first current mirror having first and second outputs, the first output being coupled to the first input of the reference voltage circuit;

a second current mirror having ~~first an input and second outputs an output~~, the first output being coupled to the sensing device; and

a compensation circuit having ~~first an input and second inputs an output~~ coupled respectively to the second ~~outputs output~~ of the first current mirror and the input of the second current mirror, wherein the first current mirror includes:

a first mirror leg coupled between a supply voltage and the ~~first~~-input of the compensation circuit;

a second mirror leg coupled between the supply voltage and the first input of the reference voltage circuit; and

a third mirror leg coupled between the supply voltage and a ~~first-second~~ input of the reference voltage circuit.

Amendments to the Drawings:

The attached sheets of drawings include changes to Figures 1 and 5. These sheets, which includes Figs. 1-7, replaces the original sheets including Figs. 1-7.

Attachment: Replacement Sheets